

1, 3, 8, 9, 10, 11, and 13 with all the changes shown is also attached.

IN THE CLAIMS:

Claims 1-42 are cancelled ✓

Please add the new claims 43-80 to the specification ✓

IN THE ABSTRACT:

Please add the attached Abstract of the Disclosure to the specification ✓

REMARKS

Claims 1-42 have been cancelled and replaced with claims 43-80 drafted in proper U.S. format. Proper headings according to the guidelines for drafting a nonprovisional patent application under 35 U.S.C. 111(a) have been added. A proper Abstract of the Disclosure has been added to the specification.

In view of the foregoing, it is submitted that this application is now in condition for allowance and such allowance is respectfully solicited.

Authorization is herewith given to charge any fees or any shortages in any fees required during prosecution of this application and not paid by other means to Patent and Trademark Office deposit account 50-1199.

Respectfully submitted on June 20, 2001

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Encl.: new claims 43-80; clean copies and marked-up versions of pages 1, 3, 8, 9, 10, 11, 13; Abstract

MARKED-UP VERSION OF PAGE 1

Illumination Method, Illumination System and the Components Thereof, Especially for Illuminating Hollow Bodies such as Signs, Inscriptions, Letters, Especially Relief Letters and the Like as well as a Sign, An Inscription and a Letter, Especially Relief Letter with Illumination

Background of the Invention

The invention relates to a lighting method, lighting system and its components, in particular for illuminating hollow elements such as signs, inscriptions, letters, in particular relief letters and the like, and a sign, inscription, letter, in particular a relief letter with illumination means.

When hollow elements such as signs, inscriptions, letters and in particular relief letters such as are used, for example, in outdoor advertising are illuminated, there is the problem of illuminating the respective hollow element, that is to say a relief letter for example, in a uniform way. Such relief letters are usually made up of a housing for accommodating lighting means such as tubular lamps and a translucent, usually colored housing cover in the form of the letter. It is to be noted here that the term "relief letter" is to be understood as referring to all types of internally illuminated, three-dimensional letters, numerals, characters and logos, that is to say not only to the 26 letters of the Latin alphabet.

In particular in the case of relief letters, uniform illumination is not a minor technical lighting problem if the letters are to be easily readable even from a distance. If the illumination is not uniform, it is possible, for

MARKED-UP VERSION OF PAGE 3

a Y presents further problems if the illumination is to be uniform. Although LED technology has a range of fundamental advantages over tubular lamps, for this reason LED tubes have not been able to gain acceptance in practice particularly with letters.

Summary of the Invention

Taking the above as a starting off point, the invention is based on the object of specifying a lighting method and a lighting system which permit the advantages of LED technology to be used even when solving complicated illumination problems, such as the illumination of relief letters.

The object is achieved on the one hand by a system, in particular for illuminating hollow elements such as signs, inscriptions, letters, in particular relief letters and the like, comprising a number of printed circuit boards provided with LEDs, cables for connecting the printed circuit boards to one another and/or for connecting the printed circuit boards to a voltage source, attachment elements for attaching the printed circuit boards to a desired location ~~according to Claim 1~~. The system has a range of considerable advantages: it can be retrofitted, can be used universally, requires only a few different components, does not require any high voltage and is easy to mount.

As a result of the use of the technology according to the invention, it is also possible to replace the tubular lamps in already existing inscriptions and letters. In this way the power consumption can be reduced by 90%.

The service life of the LEDs is up to 100,000 hours. They are fully recyclable and are manufactured in an environmentally friendly way.

Further advantages are:

Less hazardous handling during maintenance and mounting procedures as a result of 12 Volt technology (neon tubes = operate at high voltage of 6000 Volts and higher) ~~=> Different~~ which also results in a different

MARKED-UP VERSION OF PAGE 8

lines, the distance between the two lines being approximately 25 to 35 mm and the distance between two adjacent LEDs arranged on a line being approximately 30 to 40 mm.

26. ~~Printed circuit board according to Claim 25,~~
~~characterized in that the~~ The printed circuit board is
approximately 140 to 160 mm long, approximately 32 to 42 mm wide
and approximately 1 to 3 mm thick.

27. ~~Printed circuit board according to one of Claims 10 to~~
~~27, characterized in that an~~ An opening for an attachment element
for attaching the printed circuit board is provided.

28. ~~Printed circuit board according to one of Claims 10 to~~
~~27, characterized in that at~~ At least two connecting points each
with a positive lead and a negative lead for current are provided,
each connecting point being designed for the connection of
standardized plugs.

29. ~~Printed circuit board according to Claim 28,~~
~~characterized in that a~~ A guide groove for guiding a plug is
provided in the vicinity of each connecting point.

30. ~~Printed circuit board according to Claim 28 or 29,~~
~~characterized in that a~~ A corresponding element which is at least
partially complementary to a latching element of a plug, in
particular a mounting opening, is provided in the vicinity of each
connecting point.

MARKED-UP VERSION OF PAGE 9

~~31. Plug for a system according to one of Claims 1 to 10,~~
~~characterized in that the~~ The plug for a system according to the
invention is designed in such a way that a plug which is connected
 to a connecting point of a printed circuit board protects the
 positive and negative leads against moisture.

~~32. Plug for a system according to one of Claims 1 to 10,~~
~~characterized in that the~~ The plug has a latching element which,
 after the plug has been fitted onto a printed circuit board,
 latches with a corresponding element provided for that purpose on
 the printed circuit boards.

~~33. Attachment element for a system according to one of~~
~~Claims 1 to 10, characterized in that a~~ An attachment element for
a system according to the invention has a self-adhesive film is
~~provided~~ on one flat side of the attachment element.

~~34. Attachment element for a system according to one of~~
~~Claims 1 to 10, characterized in that at~~ An attachment element for
a system according to the invention has at least one bearing
 surface for a printed circuit board and a mounting element which
 latches to the printed circuit board and presses the printed
 circuit board against the bearing surface are provided.

~~35. Power supply unit for a system according to one of Claims~~
~~1 to 10, characterized in that a~~ A power supply system for a system
according to the invention has a DEAD-OFF module is provided which
 terminates the life of the power supply unit if overheating by a
 predefined limiting value occurs.

~~36. Power~~ The power supply unit for a system according to the
invention ~~one of Claims 1 to 10, characterized in that it is vacuum~~
 sealed and suitable for external use.

MARKED-UP VERSION OF PAGE 10

37. ~~Solar~~ A solar module for a system according to the invention one of Claims 1 to 10, characterized in that has a buffer battery and a voltage monitor ~~are provided~~.

38. ~~Control~~ A control module for a system according to the invention one of Claims 1 to 10, characterized in that is configured such that the lighting system is automatically switched on or off when predefinable peripheral conditions occur, for example times or brightness levels.

39. ~~Regulating~~ A regulating module for a system according to the invention one of Claims 1 to 10, characterized in that it is designed for the selective regulation of the power supply of individual printed circuit boards and/or individual LEDs on the printed circuit boards.

40. ~~Sign~~ A sign, inscription, letter, in particular relief letter with illumination means, ~~characterized in that~~ is configured such that the illumination is powered by means of a system or parts of a system according to the invention one of Claims 1 to 39.

41. ~~Use of a~~ The system or parts of a system according to ~~one of Claims 1 to 39~~ the invention are used for illuminating a sign, inscription or a letter, in particular a relief letter.

42. ~~Lighting~~ According to the lighting method of the invention, in particular for illuminating hollow elements such as signs, inscriptions, letters, in particular relief letters and the like, ~~characterized in that~~ a number of printed circuit boards provided with LEDs are connected to one another and/or to a voltage source by means of cables, and ~~in that~~ the printed circuit boards are

MARKED-UP VERSION OF PAGE 11

attached to a desired location by means of attachment elements.

Brief Description of the Drawings

Further details and advantages of the invention are to be found in the following description of a number of purely exemplary and nonrestrictive exemplary embodiments, in conjunction with the drawing, in which:

Fig. 1 shows a printed circuit board according to the invention with three LEDs in a plan view,

Fig. 2 shows the printed circuit board according to Fig. 1 in a side view,

Fig. 3 shows a printed circuit board according to the invention with six LEDs in a plan view,

Fig. 4 shows the printed circuit board according to Fig. 3 in a side view,

Fig. 5 shows a printed circuit board according to the invention with nine LEDs in a plan view,

Fig. 6 shows the printed circuit board according to Fig. 5 in a side view,

Fig. 7 shows an attachment element for attaching a printed circuit board in a plan view,

Fig. 8 shows the attachment element according to ~~{lacuna}~~ according to Fig. 7 in a side view;

Fig. 9 shows the inner side of a first relief letter;

Fig. 10 shows the inner side of a second relief letter; and

Fig. 11 shows the inner side of a third relief letter.

Description of Preferred Embodiments

Figures 1 to 6 show three different exemplary embodiments of the printed circuit boards 10, 30 and 50 according to the invention, which differ in the number of respectively provided LEDs and protective resistors and in the dimensions, but have the same basic design so that these three exemplary embodiments are described together in order to avoid repetitions.

MARKED-UP VERSION OF PAGE 13

provided on a corresponding plug so that a plug which is fitted on is advantageously secured against slipping down.

As is clear from Figures 1 to 6, the wiring of the LEDs is failsafe: if an LED in a group of three fails, the entire group of three is "dead", but this does not affect the other LED groups provided on the printed circuit board nor printed circuit boards connected in series with the affected printed circuit board.

In Figures 7 and 8, an attachment element, designated in its entirety by 90, for a printed circuit board is shown, in which attachment element two supporting plungers 94 which each form a bearing surface for a printed circuit board on a supporting plate 92 and a mounting element 96 which latches to the printed circuit board and presses the printed circuit board against the bearing surface are provided. Latching projections 100 corresponding to the latching element are formed on the latching element which is divided in two here. An adhesive strip 98, by means of which the mounting element can be particularly easily attached, for example in a relief letter, is provided under the supporting plate 92.

Figures 9 to 11 show the inside of the housing rear wall of three different relief letters with different heights, onto which inside printed circuit boards are adhesively bonded in a manner according to the invention.

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